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| 10/758,454 | 01/14/2004 | David R. Battiste | CPCM:0005/FLE (210021) | 5638 |

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| EXAMINER | |
|---|---|
| TESKIN, FRED M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1713 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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| 3 MONTHS | 01/05/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/758,454 | BATTISTE, DAVID R. | |
| | Examiner | Art Unit | |
| | Fred M. Teskin | 1713 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 October 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,3-14,29 and 31-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-13,29 and 31-43* is/are rejected.

7)☒ Claim(s) *14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 October 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Amendments presented in the reply of October 19, 2006 are acknowledged. With entry of the reply, claims 1, 3-14, 29 and 31-43 are currently pending and under examination.

Applicant's arguments, see pages 10-11, filed October 19, 2006, with respect to the rejection(s) of claim(s) 1-14 and 29-35 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly discovered prior art to Long et al and Marrow et al as detailed below.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 36-39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 36 is rendered confusing and internally inconsistent by recitation of the alternative limitations "the conduit or vessel," when only "a conduit" is earlier recited (see, line 4 and *cf.*, line 2). This creates uncertainty as to whether exposure of the contents of the conduit to radiation emission from the spectroscopic probe is an essential limitation of claims 36-39. Clarification and appropriate correction are required.

Claims 1, 3-13 and 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2006/0136149 (Long et al) or US 2004/0133364 (Marrow et al).

Each reference relates to on-line measurement and control of polyolefin properties by Raman spectroscopy and methods of controlling a reactor using real-time, on-line property data provided by Raman spectroscopic measurements. The polyolefin being produced in a polymerization system that includes either a fluidized bed reactor system (Long et al) or a slurry reactor system (Marrow et al).

More specifically, Long et al and Marrow et al individually teach a method of determining polyolefin properties on-line, including the steps of obtaining a regression model for determining a polymer property, the regression model including principal component loadings and principal component scores, acquiring a Raman spectrum of a polyolefin sample, calculating a new principal component score from at least a portion of the Raman spectrum and the principal component loadings, and calculating the polymer property by applying the new principal component score to the regression model. (Long, paragraph 0037 and Marrow, paragraph 0008.) Embodiments wherein the spectral probe is placed or inserted *in-situ* into the polymerization reactor system where granular polymer is moving are specifically taught; see Long at paragraph 0075 and paragraphs 0178, 0180 and 0181 which discuss preferred embodiments wherein the Raman probe may be inserted *in-situ* into at least one location within the polymerization system selected from the reactor body, the *cycle gas piping*, the *product discharge system* downstream of the reactor body, in the cyclone, in the purger/degasser, in the transfer line to finishing/pack-out, and in the *feed bins to the extruder*.

Marrow et al similarly teach (paragraph 0056) that the probe head may be positioned in an output conduit of the slurry reactor; or in the *product flowstream* downstream of a high-pressure flash tank, downstream of a low-pressure flash tank, or downstream of a purge column.

As per applicant's claim 1, the "conduit contents" can be a reactor discharge, a recovered component or an extruder feed; and each of dependent claims 3-13 and 40-42 is considered readable on at least one of such contents.

Examiner construes the claim term "recovered component" as inclusive of the recycle gas stream of Long et al, which is contained in line 30 of the reactor system disclosed therein (see, Long paragraph 0040). Placement of a Raman spectroscopic probe into a conduit containing such recycle gas (i.e., cycle gas piping) or a conduit containing reactor discharge or an extruder feed is contemplated by Marrow et al and/or Long et al, as noted above.

As such, the cited references differ from the claimed invention essentially in that the placing of a spectroscopic probe of a *low-resolution* Raman spectroscopic system into a conduit of a polyolefin production system is not specifically disclosed.

However, Long et al and Marrow et al each exemplify use of a Raman system including a 125 mW diode laser operating at 785 nm, the same frequency as applicant's "785 nm low resolution Raman system" (see, Long at paragraphs 0129 and 0165; Marrow at paragraph 0091 and *cf.* Specification, p. 46, ll. 21+). The exemplified system is therefore considered a type of "low resolution" system as claimed.

Moreover, given the aforenoted reference teachings regarding suitable locations within the polymerization system for placement of the spectral probe, it would have been obvious to one of ordinary skill in the art to place the probe of the Raman system exemplified in Long et al or Marrow et al in a conduit of a polyolefin production system containing the requisite contents, motivated by a reasonable expectation of successfully acquiring spectral data correlatable to a property of interest to the patentees; e.g., melt flow rates, densities or molecular weight distributions (per Long, paragraph 0097). Further, concerning claims 10-13, determination of density in this manner would indirectly indicate a chemical property, namely, concentration of comonomer in the polymer product, inasmuch as polyolefin density depends upon the type and *amount* of comonomer used, as noted in Long et al, paragraph 0053.

Claims 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2006/0136149 (Long et al).

The discussion of Long et al set out in the preceding rejection is incorporated herein by reference. To place the Raman spectroscopic probe of Long et al into a conduit of a monomer recovery system of a polyolefin production system would have been obvious to one of ordinary skill in the art since Long et al (I) identify the cycle gas piping of a gas phase polymerization reactor system as a location for *in-situ* insertion of a Raman probe (paragraph 0180) and (II) describe a reactor system wherein the gas stream being recycled (hence "recovered") contains principally unreacted monomer (paragraphs 0040-0041 and Fig. 1) .

As to claims 37-38, inclusion of ethylene and 1-hexene in the cycle piping (i.e., conduit) of Long et al would have been obvious when producing the polyethylene copolymers generically taught therein. In this respect, see paragraph 0049 regarding operation of the patentees' reactor to produce polyethylene and paragraph 0051 wherein 1-hexene is listed as a preferred comonomer. Furthermore, Long et al provide (paragraph 0180) for *in-situ* obtainment of Raman spectra correlated to at least one property selected from a polymer property and a *reactor operability* property. Accordingly, when undertaking polyethylene production in the patentees' reactor system, it would have been obvious to one of ordinary skill to determine ethylene concentration in the cycle gas line thereof, as this parameter would logically have been expected to affect operability of the fluidized bed reactor in continuously producing the intended product.

Claims 29, 31-35 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marrow et al, in combination with US 6204344 (Kendrick et al).

Marrow et al relate to on-line measurement and control of polyolefin properties by Raman spectroscopy and methods of controlling a slurry reactor system using real-time, on-line property data provided by Raman spectroscopic measurements (paragraphs 002 and 008-009). Marrow et al specifically teach (paragraph 0056) that the Raman probe head may be positioned in an output conduit of the slurry reactor; or in the *product flowstream* downstream of a high-pressure flash tank, downstream of a low-pressure flash tank, or downstream of a purge column. A slurry reactor system and

associated product recovery systems are discussed (paragraphs 0023-0024); however, the combination of reactor feed system, polymerization reactor system and monomer recovery system as specified in claim 29 is not specifically disclosed.

Nevertheless, a polyolefin production system incorporating the claimed combination of systems is well known from Kendrick et al. See in particular Fig. 1 and the related description in columns 8-9. The production system shown in Fig. 1 of Kendrick et al is seen to include elements corresponding to applicant's reactor feed system, polymerization system and monomer recovery system. Additionally, in the disclosed production system, the reactor feed system (37-39) is connected via conduits (3-5) to a polymerization system (1) that is connected via conduits (8A, 9) to a monomer recovery system (11, 16-18), which includes conduits to output recovered monomer (12) and polymer solids (27, 28).

Because Marrow et al cite the Kendrick et al patent for its disclosure of a suitable slurry reactor system (see, paragraph 0025), it would have been obvious to one of ordinary skill in the art to utilize that system as the polyolefin production system of Marrow et al. And given the aforenoted teachings regarding positioning of the probe head of Marrow et al, it would further have been obvious to the ordinary skilled practitioner to place the probe of the Raman system exemplified in Marrow et al in an output conduit of the slurry reactor or a product flowstream conduit of the Kendrick et al system (corresponding to at least one of applicant's "set conduits"), motivated by a reasonable expectation of successfully acquiring spectroscopic signal in substantially real time, as claimed. The Raman system described in Marrow et al (e.g., paragraph

0091) is considered a low-resolution system because, as noted *supra*, it includes a laser operating at the same frequency (785 nm) as the Raman system used by applicant and characterized as "low resolution" herein.

Claim 14 is objected to as being dependent on a rejected base claim but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim.

Claim 39 would be allowable if amended or rewritten to overcome the rejection under 35 U.S.C. 112 set forth in this Office action and to include all the limitations of the base claim and any intervening claim.

In view of the new grounds of rejection, this action is made non-final.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner F. M. Teskin whose telephone number is (571) 272-1116. The examiner can normally be reached on Monday through Thursday from 7:00 AM - 4:30 PM, and can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The appropriate fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FRED TESKIN
PRIMARY EXAMINER
1713

FMTeskin/12-26-06